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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/400,350	09/20/1999	CLARENCE T. TEGREENE	MVIS-97-14CI	3341

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EXAMINER	
NGUYEN, KEVIN M	
ART UNIT	**PAPER NUMBER**
2674	

DATE MAILED: 12/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/400,350	TEGREENE ET AL.	
	Examiner	Art Unit	
	Kevin M. Nguyen	2674	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 October 2002* .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3,5-8,10-25 and 27-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3,5-8,10-25 and 27-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *10 October 2002* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. The amendment filed on 10/10/2002 is entered. The rejections of claims 3, 5-8, 10-25 and 27-29 are maintained.

Drawings

2. The corrected or substitute drawings were received on 10/10/2002. These drawings are acknowledged.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 3, 5, 6, 8, 10-16, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald et al (US 5,136,413) in view of Nishiberi (US 5,185,676).

As to claims 6 and 10, MacDonald et al teach the optical scanning system for scanning beam imager comprising an input port (inherently), a deformable mirror 10 which redirect beam 3 toward secondary mirror 14 (col. 4, line 49-51). The patterning cycle four times to produce 16 steps (selecting periodic scan pattern having a plurality of scan lines within a period, col. 4, lines 36-40). The computer 34 (electrical control circuit) provides a series of signals to drive the actuators of deformable mirror 10, providing correction of depth of focus, thermal fluctuations and mechanical misalignment (the deflector being of a type that produces a predicted deviation of the

redirected light beam from desired light beam at respective locations in the selected scan pattern, col. 5, lines 56-59);

it would be desirable to repeat the patterning and etching cycle four times to produce 16 steps, each step height being $\lambda/32$ for a reflector, causing a $\lambda/16$ change in the wavefront, as shown in FIG. 2A and 2C. For a phase plate or refractive element, each step height is $\lambda/16$ (col. 4, lines 36-41);

computer 34, using a series of preprogrammed algorithms, determines a correlation between the fringe pattern and aberration and/or distortion of the optical wavefront. After determining the amount and type of distortion, the computer 34 provides a series of signals to drive the actuators of deformable mirror 10, providing correction of depth of focus, thermal fluctuations and mechanical misalignment (the controllable optical element includes a deformable membrane responsive to the control signal to deform within a selected one of the scan lines to produce the corresponding correction, figure 1, col. 5, lines 52-59).

MacDonald et al fail to teach offsets the predicted deviation within selected ones of the scan lines. However. Nishiberi teaches the offset ($\pm$) deviation (21) (figure 2, col. 3, lines 52-57). It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the offset ($\pm$) deviation (21) taught by Nishiberi in MacDonald et al's scanning device because this would control accurately of the light beam scanning (col. 1, lines 66-68 of Nishiberi).

As to claim 3, Nishiberi et al teach the pivot mirrors 3a and 4a.

As to claim 5, Nishiberi et al teach biaxial rotation x-axis and y-axis (see figure 2).

As to claim 8, MacDonald et al teach computer 34, using a series of preprogrammed algorithms, determine a correlation between the fringe pattern and aberration and/or distortion of the optical wavefront. After determining the amount and type of distortion, the computer 34 provides a series of signals to drive the actuators of deformable mirror 10, providing correction of depth of focus, thermal fluctuations and mechanical misalignment (figure 1, col. 5, lines 52-59).

As to claims 11 and 15, MacDonald et al teach the optical scanning system for scanning beam imager comprising the patterning cycle four times to produce 16 steps (selecting periodic scan pattern having a plurality of scan lines within a period, col. 4, lines 36-40);

it would be desirable to repeat the patterning and etching cycle four times to produce 16 steps, each step height being $\lambda/32$ for a reflector, causing a $\lambda/16$ change in the wavefront, as shown in FIG. 2A and 2C. For a phase plate or refractive element, each step height is $\lambda/16$ (wavefront corrector as claimed, col. 4, lines 36-41);

computer 34, using a series of preprogrammed algorithms, determines a correlation between the fringe pattern and aberration and/or distortion of the optical wavefront. After determining the amount and type of distortion, the computer 34 provides a series of signals to drive the actuators of deformable mirror 10, providing correction of depth of focus, thermal fluctuations and mechanical misalignment (figure 1, col. 5, lines 52-59).

As to claims 12-14, MacDonald et al teach wavefront corrector including a deformable membrane (figure 2).

As to claim 16, MacDonald et al teach the optical scanning system for scanning beam imager comprising a light source 2, scanning mirrors 16 and 18 (figure 1). The patterning cycle four times to produce 16 steps (col. 4, lines 36-40);

it would be desirable to repeat the patterning and etching cycle four times to produce 16 steps, each step height being $\lambda/32$ for a reflector, causing a $\lambda/16$ change in the wavefront, as shown in FIG. 2A and 2C. For a phase plate or refractive element, each step height is $\lambda/16$ (col. 4, lines 36-41);

the scanning mirror 18 being operated to pre-distort the beam of light (5') in cycle four times to produce 16 steps (see figure 1);

MacDonald et al fail to teach the scanning mirror in the predetermined angular range. However, Nishiberi teaches the rotation scanning mirror 4a and 3a (figure 2). It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the rotation scanning mirror 4a and 3a taught by Nishiberi in MacDonald et al's scanning device because this would control accurately of the light beam scanning (col. 1, lines 66-68 of Nishiberi).

As to claims 19 and 20, MacDonald et al teach a deformable mirror 10 which redirect beam 3 toward secondary mirror 14 (col. 4, line 49-51), lens 50 (figure 3).

5. Claims 7, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald et al in view of Nishiberi as applied to claims 6 and 16 above, and further in view of Gelbart (US 6,147,789).

As to claims 7, 17 and 18, MacDonald et al teach all of the claimed limitations of claims 6 and 16, except for "the deformable membrane is a microelectromechanical (MEMS) device." However, Gelbart teaches a reflector 2 having deformable portion (figure 1b, col. 2, lines 50-53) in accordance with micromachined micro-electromechanical system MEMS technology (col. 2, lines 12-15). It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the deformable portion in accordance with micro-electromechanical system MEMS taught by Gelbart in MacDonald et al's and Nishiberi's scanning device because this would provide a fast response time combined with high contrast (see abstract of Gelbart).

6. **Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald et al in view of Nishiberi as applied to claim 11 above, and further in view of Smith et al (US 5,828,455) and Wine et al (US 6,245,590).**

As to claim 13, MacDonald et al and Nishiberi teach all of the claimed limitation of claim 11, except for the wavefront corrector includes a microelectromachenical device. However, Smith et al teach aberrated wavefront Wa Φ(u) (wavefront corrector as claimed, col. 4, lines 48-50) including a wafer plane IP (figure 3, col. 4, lines 54-57). It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the wavefront corrector taught by Smith et al in MacDonald et al's and Nishiberi's scanning device because this would increase the sensitivity, the xy stage is dithered (col. 10, lines 47-48 of Smith et al). MacDonald et al, Nishiberi and Smith et al fail to teach microelectromachanical (MEMS) device. However, Wine et al teaches a MEMS device forming in a semiconductor wafer (col. 29, lines 12-13). It

would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the a MEMS device forming in a semiconductor wafer taught by Wine et al in MacDonald et al's, Nishiberi's and Smith et al's scanning device because this would reduce the amount of light energy, the modulation frequency of the beam while decreasing the cost and complexity of the overall display (col. 27, lines 62-67 of Wine et al).

7. **Claims 21-23 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Melville (US 6,049,407) in view of Gelbart.**

As to claims 21-23 and 27 and 28, Melville teaches the mirror 45 that moves at extreme angle (figure 4b, col. 10, lines 13-14), with the horizontal scan period 90, 92 and 96 at a resonant frequency (figure 8, col. 10, lines 40-41), the mirror 45 moves at a first extreme rotational offset $\theta 1$ and offset $\theta 2$ at resonant frequency (col. 10, lines 25-30), controlling deflection of the mirror 42 about the axis 45', the support 44 serves to deflect the mirror along a horizontal scan path (figure 4a, col. 9, lines 1-6).

Melville fails to teach the resonant reflector is a microelectromachanical membrane. However, Gelbart teaches a scanning module which includes a micromachined having deformable mirror and membrane (2) (figure 1b, col. 2, lines 50-53). It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the micromachined having deformable mirror and membrane taught by Gelbart in Melville's scanning device because this would provide a fast response time combined with high contrast.

As to claim 29, Gelbart teach micromachined having deformable mirror and membrane (2) (figure 1b, col. 2, lines 50-53).

8. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Melville in view of Gelbart al as applied to claim 21 above, and further in view of MacDonald et al.

As to claim 24, Gelbart and Melville et al teaches all of the claimed limitations of claim 21, except for "the desired deformation range is sufficiently large to correct for phase front distortion…" However, MacDonald et al teach computer 34, using a series of preprogrammed algorithms, determine a correlation between the fringe pattern and aberration and/or distortion of the optical wavefront. After determining the amount and type of distortion, the computer 34 provides a series of signals to drive the actuators of deformable mirror 10, providing correction of depth of focus, thermal fluctuations and mechanical misalignment (figure 1, col. 5, lines 52-59). It would have been obvious to a person of ordinary skill in the art at the time of the invention to utilize the wavefront corrector taught by MacDonald et al in Gelbart's and Melville et al's scanning device because this would extend diffraction-limited imaging to large field of view (see col. 2, lines 8-9 of MacDonald et al).

As to claim 25, MacDonald et al teach it would be desirable to repeat the patterning and etching cycle four times to produce 16 steps, each step height being $\lambda/32$ for a reflector, causing a $\lambda/16$ change in the wavefront, as shown in FIG. 2A and 2C. For a phase plate or refractive element, each step height is $\lambda/16$ (col. 4, lines 36-41).

Response to Arguments

9. Applicant's arguments with respect to claims 3, 5-8, 10-25 and 27-29 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kevin M. Nguyen** whose telephone number is **703-305-6209**. The examiner can normally be reached on MON-FRI from 9:00-5:00 with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Richard A Hjerpe** can be reached on **703-305-4709**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered response should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Kevin M. Nguyen
Examiner
Art Unit 2674

RICHARD HJERPE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600